

USABILITY AND LEARNING EXPERIENCE IN E-LEARNING PLATFORMS: A CROSS-SECTIONAL APPROACH

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Abstract

The increasing adoption of e-learning platforms has transformed teaching and learning practices in higher education. This study aimed to evaluate the usability of e-learning platforms and examine student satisfaction among BSCS students in Pakistan. A quantitative research design was employed, and data were collected through a structured questionnaire distributed to BSCS students with experience using learning management systems (LMS). The questionnaire examined platform usage, usability, accessibility, communication and collaboration features, assessment and feedback functions, and overall student satisfaction. Descriptive statistical techniques, including frequency, percentage, and mean analysis, were used to analyze the collected data. The findings indicate that students generally reported positive perceptions regarding platform usability, accessibility, communication tools, assessment functions, and overall learning experience. Moodle, Google Classroom, and Microsoft Teams emerged as the most frequently used platforms among respondents. However, internet connectivity and accessibility under low-bandwidth conditions remained important challenges. The study concludes that improving platform usability, accessibility, technical support, and communication features can enhance student satisfaction and learning effectiveness in higher education institutions.

1. Introduction

The integration of digital technologies into education has transformed traditional teaching and learning practices worldwide. E-learning platforms have become an essential component of higher education, enabling students and instructors to interact, access learning materials, complete assessments, and participate in academic activities through online environments. The growing availability of internet services and digital devices has further accelerated the adoption of online learning systems in universities. Learning Management Systems (LMS) such as Moodle, Google Classroom, Microsoft Teams, Canvas, Blackboard, Brightspace, and Schoology are

widely used to support teaching and learning activities. These platforms provide various features including course management, content delivery, communication tools, discussion forums, assignment submission, grading systems, and assessment management. As universities increasingly rely on digital learning environments, the usability and effectiveness of these platforms have become important concerns for educational institutions.

The COVID-19 pandemic significantly increased the use of e-learning platforms across the world, including Pakistan. Many universities adopted online learning systems to ensure the continuity of educational activities during periods of restricted physical interaction.

Even after the pandemic, e-learning platforms continue to play an important role in supporting blended and online learning approaches. Understanding students' experiences with e-learning platforms is essential because platform usability directly influences engagement, learning effectiveness, and overall satisfaction. Therefore, evaluating the usability of e-learning platforms and examining student satisfaction can provide valuable insights for improving digital learning environments in higher education institutions.

Background of the Study

E-learning has emerged as one of the most important developments in modern education. Advances in information and communication technologies have enabled educational institutions to provide learning opportunities beyond traditional classroom settings. Learning Management Systems (LMS) have become the primary technological infrastructure supporting online and blended learning environments in higher education. Universities worldwide use a variety of e-learning platforms, including Moodle, Google Classroom, Microsoft Teams, Canvas, Blackboard, Brightspace, and Schoology. These platforms offer features that support course delivery, communication, collaboration, assessment, and feedback processes. The effectiveness of these platforms depends largely on their usability, accessibility, and ability to meet students' learning needs. In Pakistan, the adoption of e-learning platforms increased significantly during the COVID-19 pandemic. Universities rapidly implemented LMS solutions to facilitate online teaching and learning. However, students continue to face challenges related to internet connectivity, platform usability, accessibility, technical support, and communication features. Such challenges may affect learning experiences and overall satisfaction with e-learning systems. Previous studies have highlighted the importance of usability, accessibility, communication, and assessment features in determining the success of e-learning platforms. However, limited research has focused on evaluating multiple learning platforms from the perspective of BSCS students in Pakistan. Therefore, this study aims to examine platform usability and student satisfaction in order to identify strengths, limitations, and

opportunities for improving e-learning experiences in higher education.

1.2 Statement of the Problem

The rapid adoption of e-learning platforms in higher education has transformed the way students access educational resources, communicate with instructors, and complete academic activities. Universities in Pakistan increasingly rely on Learning Management Systems (LMS) such as Moodle, Google Classroom, Microsoft Teams, and other online learning platforms. Despite their widespread use, students often experience challenges related to usability, accessibility, communication features, assessment functions, and overall learning experience. Many previous studies have focused on technology adoption and general e-learning effectiveness, while limited attention has been given to comparing different learning platforms from the perspective of BSCS students in Pakistan. Furthermore, issues such as ease of navigation, mobile accessibility, internet connectivity, communication tools, and student satisfaction remain underexplored in the local context. Therefore, there is a need to evaluate the usability of e-learning platforms and examine student satisfaction to identify strengths, limitations, and areas for improvement.

1.3 Research Questions

This study addressed the following research questions:

Which e-learning platforms are most frequently used by BSCS students in Pakistan?

How do students evaluate the usability of the e-learning platforms they use?

How accessible are e-learning platforms in terms of content availability and internet accessibility?

How effectively do e-learning platforms support communication and collaboration?

How do students evaluate assessment and feedback features available in e-learning platforms?

1.4 Significance of the Study

This study is significant because it provides insights into the usability and effectiveness of e-learning platforms used by BSCS students in Pakistan. The findings may help universities

improve their learning management systems and enhance students' learning experiences. The study may also assist instructors in understanding students' expectations regarding communication, accessibility, assessment, and feedback features. Furthermore, the findings can support platform developers in designing more user-friendly and accessible learning environments. Policymakers and educational administrators may use the results to make informed decisions regarding digital learning infrastructure and technology integration in higher education institutions.

2. Review of Related Literature

2.1 Introduction to E-Learning and Learning Management Systems

E-learning refers to the use of digital technologies and internet-based platforms to facilitate teaching and learning activities. It has become an essential component of modern education because it enables students to access educational resources anytime and anywhere. Universities around the world increasingly use e-learning systems to support both traditional and online learning environments. The growth of digital technologies and the expansion of internet access have significantly increased the adoption of e-learning in higher education. A Learning Management System (LMS) is a software platform that helps educational institutions manage, deliver, and monitor learning activities. LMS platforms provide features such as course management, assignment submission, online assessments, and communication tools, grading systems, and learning resources. Commonly used LMS platforms include Moodle, Google Classroom, Microsoft Teams, Canvas, Blackboard, Brightspace, and Schoology. The importance of LMS platforms increased significantly during and after the COVID-19 pandemic when universities were forced to shift toward online learning. These systems allowed institutions to continue educational activities despite physical restrictions. In Pakistan, many universities adopted LMS platforms to support online teaching and learning, making them an important part of the higher education system. As educational institutions continue to integrate technology into learning processes, understanding the effectiveness, usability, and

impact of LMS platforms has become increasingly important. Therefore, evaluating e-learning platforms from the perspective of students is essential for improving educational quality and student learning outcomes.

2.2 E-Learning Platform Usability

Usability is one of the most important factors determining the success of an e-learning platform. It refers to the extent to which a system can be used effectively, efficiently, and satisfactorily by its users. In the context of Learning Management Systems, usability includes ease of navigation, user-friendly interface design, and accessibility of learning materials, responsiveness, and overall system performance. Students are more likely to engage with an LMS when it is easy to understand and use. A well-designed platform allows users to quickly locate course materials, submit assignments, communicate with instructors, and participate in learning activities without unnecessary difficulties. Poor usability may create frustration and negatively affect the learning experience. The DeLone and McLean Information Systems Success Model highlights system quality, information quality, and service quality as important determinants of user satisfaction and system success. These theoretical perspectives emphasize the importance of usability in determining the effectiveness of e-learning platforms. Therefore, evaluating platform usability is essential for understanding how students interact with LMS platforms and how these interactions influence their learning experience and satisfaction.

Student learning experience refers to students' perceptions, engagement, participation, and overall interaction with educational activities and learning technologies. In online learning environments, the quality of the learning experience is strongly influenced by the design and functionality of the e-learning platform being used. Effective LMS platforms can enhance learning experiences by providing organized course content, interactive learning tools, communication features, and flexible access to educational resources. Students who can easily access materials, participate in discussions, and receive timely feedback are more likely to have positive learning experiences. Learning experience also includes

factors such as motivation, engagement, collaboration, and perceived learning effectiveness. Platforms that support communication between students and instructors help create a more interactive learning environment. Similarly, features such as discussion forums, video conferencing, and collaborative activities can improve student participation and knowledge sharing. Previous studies have shown that positive learning experiences contribute to improved academic performance, higher levels of engagement, and increased satisfaction with online learning systems. Therefore, understanding students' learning experiences is important when evaluating the effectiveness of e-learning platforms in higher education. Student

satisfaction is a key indicator of the success of e-learning platforms. It reflects students' overall evaluation of their learning experiences and their perceptions of the quality and effectiveness of the LMS being used. Higher levels of satisfaction generally indicate that the platform successfully meets students' educational needs and expectations. Several factors influence student satisfaction with e-learning platforms. These include system quality, information quality, service quality, usability, accessibility, instructor support, and technical support. Students are more likely to be satisfied when the platform is reliable, easy to use, and capable of providing the resources necessary for successful learning.

Table 1. Review of the Recent Studies

Author(s)	Year	Country	Platform Studied	Methodology	Key Findings
Al-Rahmi et al.	2019	Malaysia	Multiple LMS	TAM with IDT	System quality, information quality, and service quality explained substantial variance in user satisfaction; information quality emerged as the strongest predictor of learning outcomes
Mtebe& Raphael	2018	Tanzania	Moodle	Regression analysis	System quality, instructor quality, and service quality significantly influenced learner satisfaction; service quality was the strongest predictor
Al-Fraihat et al.	2020	United Kingdom	Multiple platforms	PLS-SEM	Seven quality factors explained 71.4% of satisfaction variance; perceived usefulness and satisfaction were key determinants of net benefits
Alduaij et al.	2024	Kuwait	Moodle PLMS	SmartPLS	System and information quality positively affected perceived ease of use; learner quality significantly predicted satisfaction and usefulness
Toring et al.	2022	Philippines	Brightspace	SEM	System content, interaction, and technology quality significantly influenced perceived usefulness and subsequent LMS satisfaction
Yilmaz	2022	Turkey	Moodle vs Google Classroom	Mixed methods	Google Classroom users reported higher satisfaction in system infrastructure and assessment features than Moodle users
Sarasi et al.	2022	Indonesia	Video conferencing	PLS-SEM	Platform quality positively influenced online learning success

			ng platforms		whether mediated by satisfaction or usage; computer anxiety negatively affected outcomes
Alotaibi & Alshahrani	2022	Saudi Arabia	Shaqra University platform	Questionnaire survey	Instructor quality, learner quality, and perceived usefulness positively impacted platform success; information and system quality showed no significant effect on use
Shehzadi et al.	2021	Pakistan	Multiple platforms	PLS-SEM	Digital learning significantly shaped student satisfaction and institutional brand image; motivation and willingness positively predicted e-learning satisfaction
Ahmed et al.	2023	Pakistan	Moodle (Baloch LMS)	Descriptive statistics	77.33% affirmed usefulness, 88% expressed satisfaction, 79.05% found the LMS easy to use
Naveed et al.	2017	Saudi Arabia	Multiple platforms	Questionnaire survey	Infrastructure and technology dimension was the most significant barrier; training was identified as the most critical success factor
Chopra et al.	2019	India	E-learning portal	SEM approach	System quality, information quality, and service quality significantly determined e-learning success from student perspective
Abuhlifa & de Quincey	2019	United Kingdom	University e-learning platform	Usability evaluation	Usability testing revealed significant gaps between platform design and student expectations; interface complexity was primary concern
Ullah et al.	2021	Pakistan	Multiple platforms	Cross-sectional survey	88% of students lacked proper internet facility; 65% were not satisfied with online learning; device and connectivity issues were primary barriers
Faize & Nawaz	2020	Pakistan	University online learning	Pre-post survey	Post-modification satisfaction mean increased from 2.03 to 3.76; student involvement and instructor interaction were key improvement areas
Dhawan	2020	India	Multiple platforms	Literature analysis	Identified SWOC of e-learning; highlighted infrastructure, digital literacy, and faculty training as critical success factors

The reviewed studies indicate that platform usability, system quality, information quality, accessibility, and learner satisfaction are among the most important factors affecting the success of e-learning systems. Previous studies consistently report that well-designed learning platforms improve student engagement,

learning experience, and academic outcomes. However, limited research has focused on comparing multiple learning platforms from the perspective of BSCS students in Pakistan.

2.3 Major Learning Platforms Used in Higher Education

Learning Management Systems (LMS) have become an essential component of higher education by supporting online teaching, learning, communication, and assessment activities. Universities worldwide use different LMS platforms based on their educational needs, technological infrastructure, and institutional requirements.

Moodle: Moodle is an open-source Learning Management System (LMS) widely used in higher education institutions. It provides tools for course management, assignments, quizzes, grading, and discussion forums. Its flexibility and customization options make it one of the most popular LMS platforms worldwide.

Google Classroom: Google Classroom is a cloud-based educational platform developed by Google. It enables instructors to distribute assignments, share learning materials, communicate with students, and manage courses efficiently. Its simple interface and integration with Google Workspace make it widely adopted in educational settings.

Microsoft Teams: Microsoft Teams is a collaboration and communication platform that supports virtual classrooms, file sharing, messaging, and video conferencing. It is commonly used by universities for online learning and collaborative academic activities.

Canvas LMS: Canvas LMS is a modern cloud-based learning management system known for its user-friendly interface and strong mobile accessibility. It supports course delivery, assessment management, communication, and learning analytics.

Blackboard: Blackboard is an enterprise-level LMS widely used by higher education institutions. It offers advanced tools for course administration, content management, assessment, communication, and student performance tracking.

Brightspace: Brightspace is a learning management system developed by D2L. It focuses on personalized learning experiences, accessibility, and learning analytics. The platform is increasingly adopted by universities because of its adaptive learning features.

Schoology: Schoology is an LMS that combines course management with social learning capabilities. It supports collaboration, content sharing, communication, and assessment activities, making it suitable for both instructors and students.

These learning platforms differ in terms of usability, accessibility, communication features, assessment tools, and overall user experience. Understanding their characteristics is important for evaluating their impact on student learning experience and satisfaction in higher education.

Table 2. Comparison of Major Learning Platforms

Feature	Moodle	Google Classroom	Microsoft Teams	Canvas	Blackboard	Brightspace	Schoology
Developer	Moodle Pty Ltd	Google Inc.	Microsoft Corp.	Instructure Inc.	Anthology Inc.	D2L Corp.	Power School Inc.
Official Website	moodle.org	classroom.google.com	microsoft.com/education	instructure.com	blackboard.com	d2l.com	schoology.com
Pricing Model	Open source (free)	Free for education	M365 Education	Subscription	Subscription	Subscription	Subscription
Deployment	Self-hosted/Cloud	Cloud only	Cloud only	Cloud only	Cloud/Self-hosted	Cloud only	Cloud only
Customization	Extensive	Limited	Moderate	Moderate	Moderate	Moderate	Limited

Mobile App	Available	Available	Available	Excellent	Available	Excellent	Available
Video Conferencing	Via plugins	Google Meet	Built-in	Via integration	Via integration	Via integration	Via integration
Assessment Tools	Comprehensive	Basic	Moderate	Comprehensive	Comprehensive	Comprehensive	Moderate
Analytics	Moderate	Basic	Moderate	Excellent	Excellent	Excellent	Moderate
Accessibility	Theme-dependent	Good	Good	Excellent	Good	Excellent	Good
Primary Strength	Flexibility	Simplicity	Collaboration	User experience	Feature depth	Adaptive learning	Engagement
Primary Limitation	Technical complexity	Limited features	Complexity	Cost	Interface complexity	Market presence	Higher features

Previous studies have extensively examined e-learning adoption, learning management system (LMS) effectiveness, and student satisfaction in different educational settings. However, most studies have focused on individual platforms, specific quality dimensions, or technology acceptance factors. Limited research has compared multiple learning platforms simultaneously from the perspective of university students in Pakistan. Furthermore, many existing studies emphasize adoption and academic performance while giving less attention to platform usability, accessibility, communication features, assessment tools, and overall learning experience. Therefore, this study addresses this gap by evaluating the usability and learning experience of different e-learning platforms used by BSCS students in Pakistan and examining their influence on student satisfaction.

2.4 Research Gap

Previous studies have extensively examined e-learning adoption, learning management system (LMS) effectiveness, and student satisfaction in different educational settings. However, most studies have focused on individual platforms, specific quality dimensions, or technology acceptance factors. Limited research has compared multiple learning platforms simultaneously from the perspective of university students in Pakistan. Furthermore, many existing studies emphasize adoption and academic performance while giving less attention to platform usability, accessibility, communication features, assessment tools, and overall learning experience. Therefore, this study addresses this gap by evaluating the usability and learning experience of different e-learning platforms used by BSCS students in Pakistan and examining their influence on student satisfaction.

2.5 Conceptual Framework

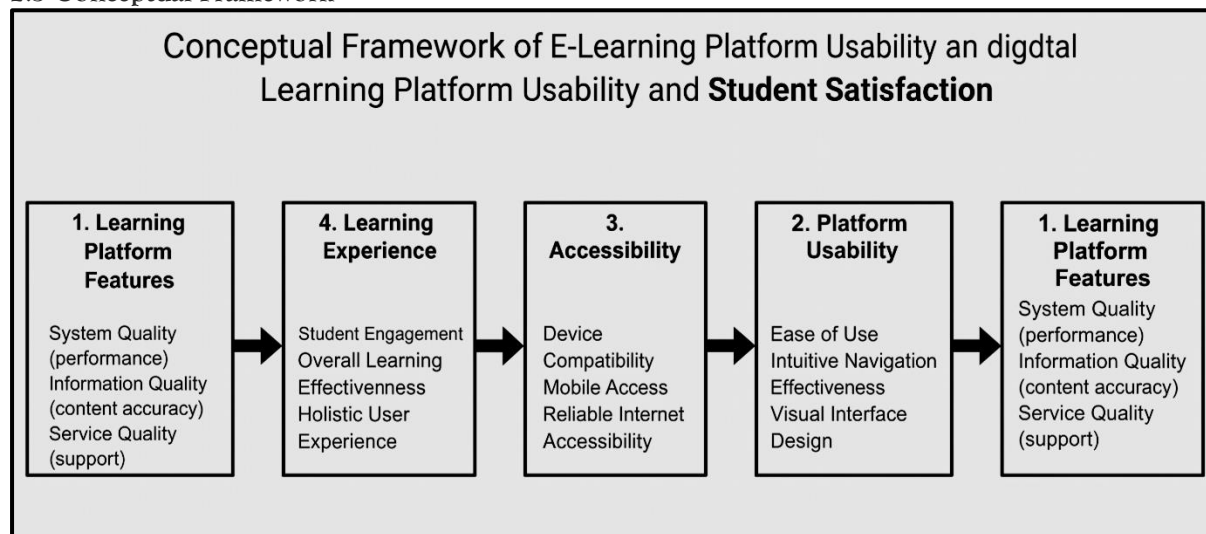


Figure 1. Conceptual Framework

The conceptual framework of this study proposes that the features of e-learning platforms influence students' perceptions of usability and accessibility. Platforms that are easy to navigate, responsive, and accessible across different devices contribute to a positive learning experience. An improved learning experience enhances student engagement, learning effectiveness, and overall satisfaction. Therefore, the framework assumes that learning platform features indirectly affect student satisfaction through usability, accessibility, and learning experience dimensions. This framework provides the theoretical foundation for evaluating e-learning platforms used by BSCS students in Pakistan.

3. Research Methodology

3.1 Research Design

This study adopted a quantitative research design to investigate the usability of e-learning platforms and student satisfaction among BSCS students in Pakistan. A survey-based approach was used to collect data from students who had experience using different learning management systems (LMS). The quantitative approach was selected because it allows the collection and analysis of numerical data related to students' perceptions and experiences.

3.2 Population of the Study

The target population of this study consisted of BSCS students enrolled in universities in

Pakistan who had experience using e-learning platforms for academic purposes. These students represented the primary users of learning management systems and were therefore considered appropriate participants for evaluating platform usability and learning experience. The study targeted undergraduate Computer Science students enrolled at universities across Pakistan. Convenience sampling was used to recruit participants through existing academic networks during April 2026. A total of 38 valid responses were obtained from students at nine institutions: Air University Multan Campus ($n = 26$), Bahauddin Zakariya University ($n = 5$), NUST ($n = 1$), GIKI ($n = 1$), MITE ($n = 1$), Nishtar Medical University ($n = 1$), Times University Multan ($n = 1$), University of Bedfordshire ($n = 1$), and University of Lahore ($n = 1$). The sample size of 38 is acknowledged as a significant limitation. While some sources suggest $n > 30$ as a rough guideline for applying parametric tests, this rule of thumb does not guarantee adequate statistical power. With this sample, the study has limited ability to detect small or medium effect sizes, and confidence intervals around correlation coefficients will be wide. These constraints should be kept in mind when interpreting results. We frame this work explicitly as a pilot study intended to generate initial insights and guide future research with larger samples.

Table 3: Demographic Characteristics of Respondents (n=38)

Characteristic	Category	Frequency (%)
Gender	Male	24 (63.2%)
	Female	14 (36.8%)
Age	18-20	13 (34.2%)
	21-23	19 (50.0%)
	24-26	3 (7.9%)
	Above 26	3 (7.9%)
Year of Study	1st Year	10 (26.3%)
	2nd Year	8 (21.1%)
	3rd Year	10 (26.3%)
	4th Year	9 (23.7%)
	Graduated	1 (2.6%)

3.3 Sample and Sampling Technique

A sample of 38 BSCS students was selected for this study. Convenience sampling was used because participants were readily available and accessible to the researcher. The selected respondents had prior experience using one or more e-learning platforms during their academic studies.

3.4 Data Collection Procedure

Data collection occurred from April 18 to April 21, 2026, using an online survey distributed via Google Forms. The survey link was shared through academic WhatsApp groups and university email lists. Participation was voluntary, and informed consent was obtained from all respondents. No personally identifiable information was collected.

The primary research instrument used in this study was a structured questionnaire. The questionnaire consisted of demographic questions and multiple sections designed to evaluate platform usage, usability, accessibility, communication and collaboration, assessment and feedback, and overall student satisfaction. Most items were measured using a five-point

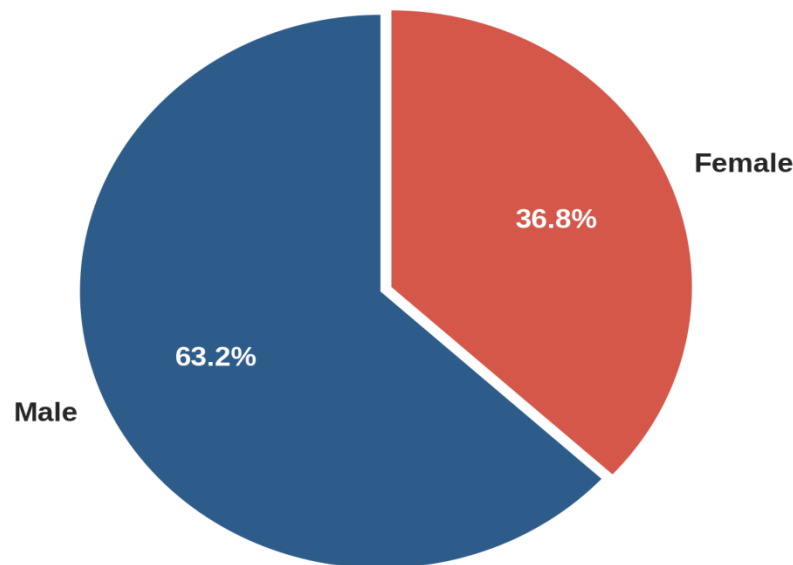
Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). The collected data were analyzed using descriptive statistical techniques. Frequency distributions and percentages were used to summarize demographic information and platform usage patterns. Mean scores were calculated to evaluate students' perceptions regarding platform usability, accessibility, communication and collaboration, assessment and feedback, and overall satisfaction. The findings were presented using tables and descriptive interpretations.

4. Data Analysis

4.1 Demographic Analysis

The sample comprised 38 BSCS students, with 63.2% male ($n = 24$) and 36.8% female ($n = 14$). The majority (50.0%) were aged 21-23 years, with 34.2% aged 18-20. Students were relatively evenly distributed across years of study: 1st year (26.3%), 2nd year (21.1%), 3rd year (26.3%), and 4th year (23.7%). Platform usage was generally frequent: 39.5% reported daily use, and 31.6% used platforms several times per week.

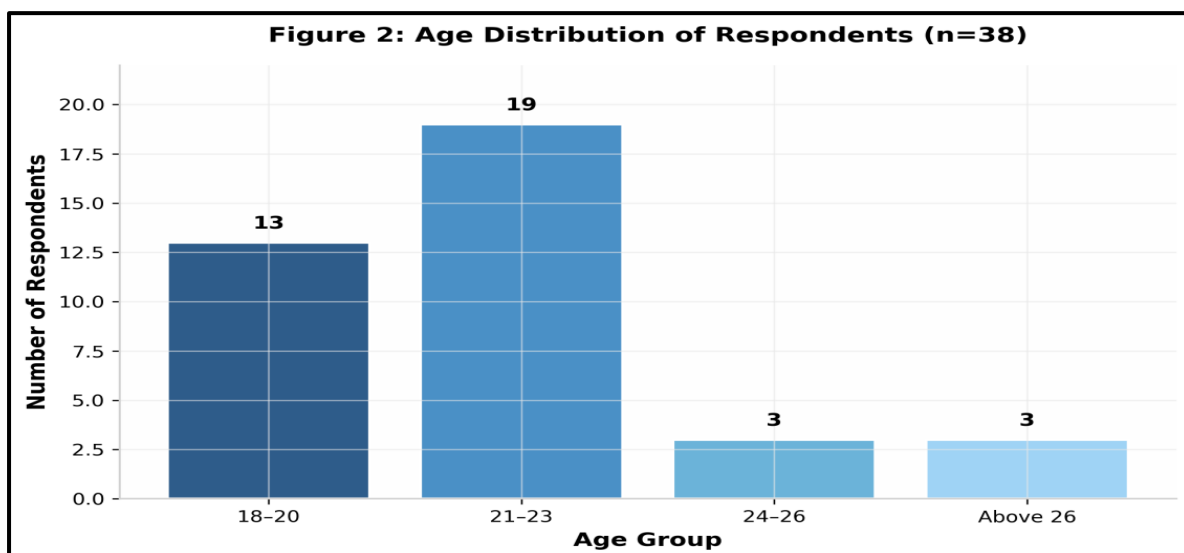
Figure 1: Gender Distribution of Respondents (n=38)



Analysis of age distribution revealed that the majority of respondents (50.0%, n=19) fell within the 21-23 age range, followed by the 18-20 age group at 34.2% (n=13). Respondents aged 24-26 and above 26 each accounted for 7.9% (n=3) of the sample. This age distribution

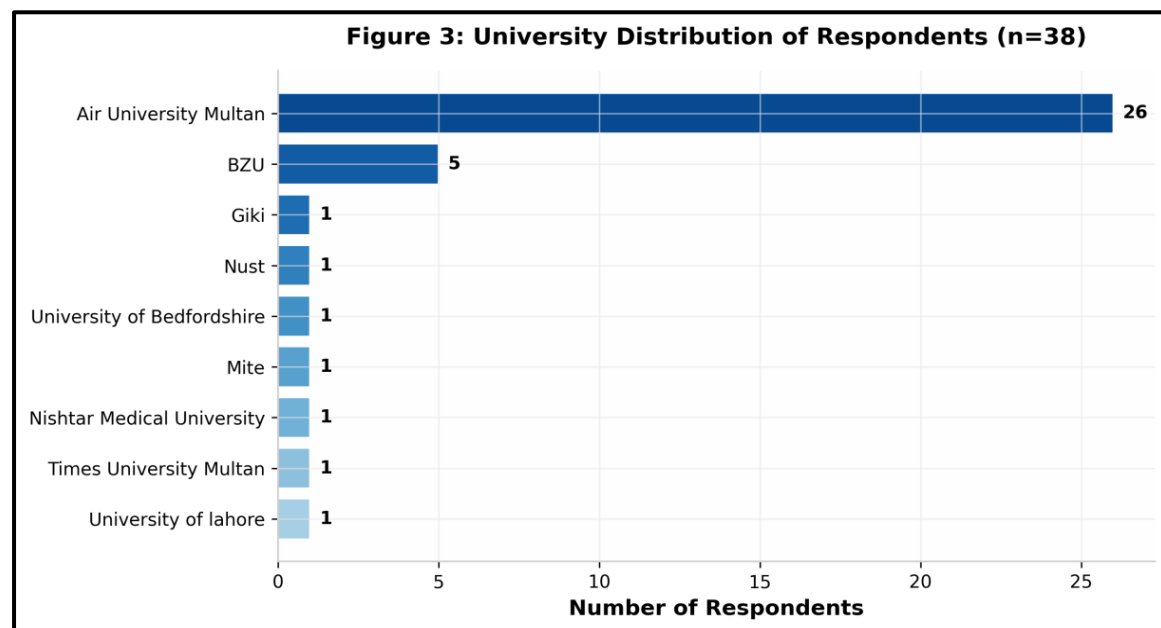
is consistent with the typical age range of undergraduate Computer Science students in Pakistani universities, where the standard duration of the BSCS program is four years following completion of higher secondary education.

Figure 2: Age Distribution of Respondents (n=38)



With respect to university affiliation, the majority of respondents (68.4%, n=26) were enrolled at Air University Multan Campus, reflecting the primary recruitment channel for the study. Bahauddin Zakariya University contributed 13.2% (n=5) of the sample, while

the remaining seven institutions each contributed one respondent (2.6% each). This distribution, while skewed toward a single institution, nonetheless provides valuable cross-institutional perspectives that provide limited cross-institutional perspectives of the findings.



The distribution by year of study revealed a relatively even spread across the first four years of the BSCS program: 1st Year (26.3%, n=10), 2nd Year (21.1%, n=8), 3rd Year (26.3%, n=10), and 4th Year (23.7%, n=9). A single graduated respondent (2.6%) also participated. This distribution ensures that the findings reflect

the perspectives of students at various stages of their academic journey, from freshmen who are relatively new to university-level e-learning platforms to senior students who have accumulated substantial experience with these systems.

4.2 Platform Usage Analysis

E-Learning Platform Usage Among Respondents (Multiple selections allowed)

Platform	Frequency (n)	Percentage (%)	Mean Satisfaction
Moodle	20	52.6%	3.68
Google Classroom	17	44.7%	3.82
Microsoft Teams	15	39.5%	3.74
Zoom	11	28.9%	3.55
Canvas	5	13.2%	3.91
Blackboard	4	10.5%	3.34
University-specific portals	8	21.1%	3.12

Assessment and Feedback Item Analysis (n = 38)

Assessment Item	SA+A (n)	SA+A (%)	Neutral (n)	Neutral (%)	D+SD (n)	D+SD (%)	Mean
Assignment submission is straightforward	30	78.9%	5	13.2%	3	7.9%	3.97
Quiz functionality works properly	26	68.4%	7	18.4%	5	13.2%	3.76
Grades are displayed clearly	28	73.7%	7	18.4%	3	7.9%	3.87
Feedback on assignments is timely	21	55.3%	9	23.7%	8	21.1%	3.50
Feedback helps me improve my work	23	60.5%	9	23.7%	6	15.8%	3.63

4.3 Platform Usability Analysis

Usability Item	SA+A (n)	SA+A (%)	Neutral (n)	Neutral (%)	D+SD (n)	D+SD (%)	Mean
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Usability Item	SA+A (n)	SA+A (%)	Neutral (n)	Neutral (%)	D+SD (n)	D+SD (%)	Mean
The platform is easy to navigate	28	73.7%	7	18.4%	3	7.9%	3.87
I can easily find course materials	27	71.1%	8	21.1%	3	7.9%	3.82
The layout is well organized	25	65.8%	9	23.7%	4	10.5%	3.71
The interface is visually appealing	22	57.9%	10	26.3%	6	15.8%	3.58
The platform responds quickly	20	52.6%	9	23.7%	9	23.7%	3.50
The platform rarely has technical errors	19	50.0%	8	21.1%	11	28.9%	3.39
Instructions and features are easy to understand	29	76.3%	6	15.8%	3	7.9%	3.92
The platform works well on different devices	30	78.9%	5	13.2%	3	7.9%	4.03

The results indicate that students generally perceived the platform as easy to use and navigate. Device compatibility and access to course materials received positive evaluations.

4.4 Accessibility Analysis

Accessibility Item	SA+A (n)	SA+A (%)	Neutral (n)	Neutral (%)	D+SD (n)	D+SD (%)	Mean
Course content is well organized	27	71.1%	8	21.1%	3	7.9%	3.84
I can access content on mobile devices	30	78.9%	5	13.2%	3	7.9%	4.00
Multimedia content loads properly	23	60.5%	9	23.7%	6	15.8%	3.63
I can download materials for offline use	18	47.4%	7	18.4%	13	34.2%	3.24
Content is accessible with slow internet	16	42.1%	8	21.1%	14	36.8%	3.13
The search function helps me find content	24	63.2%	8	21.1%	6	15.8%	3.66

The accessibility analysis suggests that students were generally satisfied with content availability and platform accessibility across different devices and internet conditions.

4.5 Communication and Collaboration Analysis

Communication Item	SA+A (n)	SA+A (%)	Neutral (n)	Neutral (%)	D+SD (n)	D+SD (%)	Mean
The platform supports easy communication with instructors	26	68.4%	8	21.1%	4	10.5%	3.76
Discussion forums are useful for learning	22	57.9%	10	26.3%	6	15.8%	3.58
I can collaborate with classmates on projects	24	63.2%	8	21.1%	6	15.8%	3.68
Messaging features are responsive	23	60.5%	7	18.4%	8	21.1%	3.55
Video conferencing integration works well	25	65.8%	7	18.4%	6	15.8%	3.71

Students reported positive perceptions regarding communication and collaboration features, particularly instructor interaction and messaging functionality.

4.6 Assessment and Feedback Analysis

Satisfaction Item	SA+A (n)	SA+A (%)	Neutral (n)	Neutral (%)	D+SD (n)	D+SD (%)	Mean
I am satisfied with the overall platform experience	25	65.8%	10	26.3%	3	7.9%	3.76
The platform meets my learning needs	24	63.2%	10	26.3%	4	10.5%	3.71
I feel comfortable using this platform	28	73.7%	7	18.4%	3	7.9%	3.87

Satisfaction Item	SA+A (n)	SA+A (%)	Neutral (n)	Neutral (%)	D+SD (n)	D+SD (%)	Mean
I would recommend this platform to others	23	60.5%	10	26.3%	5	13.2%	3.63
I want to continue using this platform	26	68.4%	8	21.1%	4	10.5%	3.76

Assessment and feedback features were generally evaluated positively, indicating that the platforms effectively support academic assessment activities.

4.7 Student Satisfaction Analysis

Satisfaction Item	SA+A (n)	SA+A (%)	Neutral (n)	Neutral (%)	D+SD (n)	D+SD (%)	Mean
I am satisfied with the overall platform experience	25	65.8%	10	26.3%	3	7.9%	3.76
The platform meets my learning needs	24	63.2%	10	26.3%	4	10.5%	3.71
I feel comfortable using this platform	28	73.7%	7	18.4%	3	7.9%	3.87
I would recommend this platform to others	23	60.5%	10	26.3%	5	13.2%	3.63
I want to continue using this platform	26	68.4%	8	21.1%	4	10.5%	3.76

The findings indicate a generally positive level of student satisfaction with e-learning platforms. Most respondents expressed willingness to continue using these platforms in the future.

4.8 Summary of Findings

The findings of the study indicate that e-learning platforms play an important role in supporting teaching and learning activities among BSCS students in Pakistan. The results show that students frequently use learning platforms such as Moodle, Google Classroom, Microsoft Teams, and other LMS solutions for accessing course materials, communication, assessments, and academic collaboration. The usability analysis revealed generally positive perceptions regarding ease of navigation, accessibility of learning materials, interface organization, and device compatibility. Accessibility results indicated that students were able to access course content across multiple devices, although internet connectivity remained a challenge for some users. Communication and collaboration features were positively evaluated, particularly instructor communication and messaging tools. Assessment and feedback functions also received favorable responses, suggesting that e-learning platforms effectively support assignment submission, quizzes, grading, and feedback processes. Overall, students reported satisfactory learning experiences and positive attitudes toward continued use of e-learning platforms in higher education. The findings suggest that platform usability, accessibility, communication, and assessment features

contribute significantly to overall student satisfaction.

The findings of this study indicate that e-learning platforms play an important role in supporting academic activities among BSCS students in Pakistan. The results show that Moodle, Google Classroom, and Microsoft Teams were the most frequently used platforms among respondents. This finding reflects the growing adoption of digital learning technologies in Pakistani universities. The usability analysis revealed generally positive perceptions regarding platform navigation, organization, ease of use, and device compatibility. Students reported that they could easily access learning materials and use platform features without major difficulties. These findings are consistent with previous studies that identified usability as an important factor influencing student engagement and satisfaction in online learning environments.

Accessibility analysis showed that students were generally satisfied with content availability and mobile access. However, lower mean scores for slow internet accessibility and offline access suggest that internet connectivity remains a challenge for many students. This finding is particularly relevant in Pakistan where students often depend on mobile internet services and face bandwidth limitations. Communication and collaboration features also received positive

evaluations. Students reported that instructor communication, discussion forums, messaging tools, and video conferencing features contributed positively to their learning experience. Similarly, assessment and feedback functions were perceived positively, indicating that e-learning platforms effectively support assignment submission, quizzes, grading, and feedback activities. Overall, the findings suggest that platform usability, accessibility, communication, and assessment features contribute to positive student learning experiences and satisfaction with e-learning platforms.

5. Implications of the Study

The findings of this study have practical implications for universities, instructors, and platform developers. Educational institutions should prioritize the selection and improvement of user-friendly learning management systems that provide reliable access to educational resources. Universities should regularly evaluate platform usability and identify areas requiring improvement, particularly in accessibility and technical support services. Platform developers should focus on responsive design, mobile compatibility, and low-bandwidth optimization to better support students in developing countries. In addition, Course instructors should organize learning materials clearly, provide timely feedback, and encourage communication through platform-based tools. Improved communication and assessment features can enhance student engagement and overall learning satisfaction. The findings may also assist policymakers and university administrators in making informed decisions regarding digital learning infrastructure and e-learning platform implementation.

6. Conclusion

This study examined the usability and learning experience of e-learning platforms among BSCS students in Pakistan. The results indicate that students generally have positive perceptions regarding platform usability, accessibility, communication features, assessment functions, and overall satisfaction. The findings show that Moodle, Google Classroom, and Microsoft Teams are among the most commonly used

learning platforms. Students reported positive experiences regarding ease of navigation, content accessibility, communication with instructors, and assessment activities. However, internet connectivity and accessibility under slow network conditions remain important challenges. Overall, the study highlights the importance of platform usability in supporting effective online learning experiences. The findings suggest that improving accessibility, communication features, technical support, and platform design can contribute to higher levels of student satisfaction and learning effectiveness.

7. Recommendations

Universities in Pakistan should optimize LMS platforms for low-bandwidth internet environments because many students rely on unstable internet connections and mobile devices for accessing e-learning systems. Educational institutions should conduct regular usability assessments of their e-learning platforms with attention to system quality, information quality, and service quality dimensions. Platform developers should prioritize intuitive navigation, responsive interfaces, and cross-device compatibility. Course instructors should organize content clearly and provide timely feedback. Institutions should also establish dedicated technical support services for students and faculty. Future research should use larger samples and longitudinal designs to track changes over time, and qualitative methods such as interviews could provide deeper insights into specific usability issues faced by students.

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